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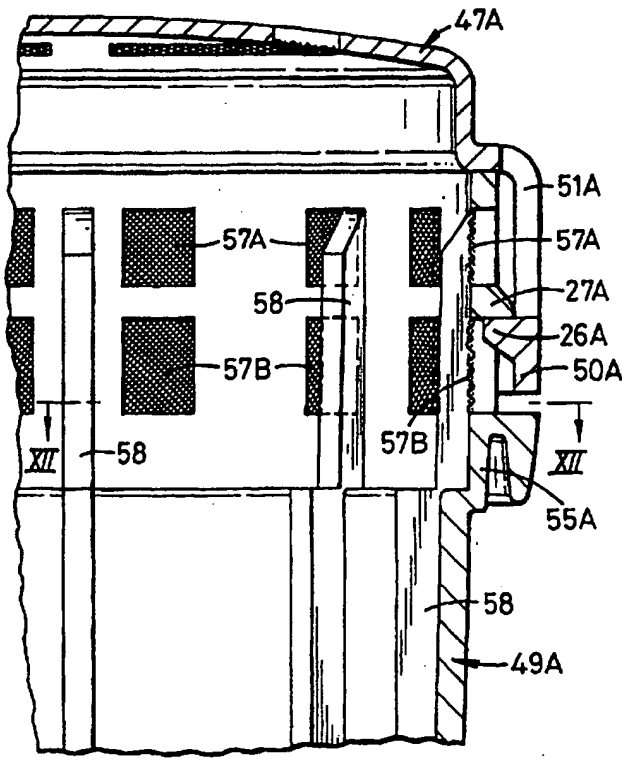
(54) Title: A WATER TREATMENT CARTRIDGE AND A WATER FILTER JUG FITTED WITH SUCH A CARTRIDGE

(57) Abstract

A drinking water treatment cartridge comprises a cup-shaped receptacle (49A) for containing water treatment particles and a closure (47A) which may be irreversibly snap-fitted thereon or welded thereto. The closure (47A) has a slotted skirt portion (50A) which surrounds a circumferential array of mesh covered apertures (57A, 57B) in a neck portion (55A) of the receptacle (49A). There are mesh covered slots in a domed crown portion of the closure (47A) and there is a mesh covered outlet aperture in the base of the receptacle (49A). Each mesh is integrally moulded with the surrounding structure by which it is supported.



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# A WATER TREATMENT CARTRIDGE AND A WATER FILTER JUG FITTED WITH SUCH A CARTRIDGE

This invention relates to a water treatment cartridge for use in a domestic water treatment apparatus, particularly a water filter jug.

Water filter jugs generally comprise a receptacle and a removable hopper, which hopper can be supported in or on the receptacle. The hopper is adapted to carry a water filter cartridge which typically comprises a moulded container having inlet and outlet slots formed therein to allow water to enter and exit an internal cavity. The cartridge contains water treatment medium in the cavity, which medium comprises a particulate filter and typically also includes granules of an adsorbent material such as activated carbon. The particles of the water treatment medium typically have diameters of the order of 200μm or more. In use, the cartridge is located in the hopper so that the inlet slots open into the hopper and the outlet slots open into the receptacle. When unfiltered water is poured into the hopper it flows through the inlet slots of the cartridge into the container and through the water treatment medium, where it is purified. The water then debouches the cartridge into the receptacle through the outlet slots. The cartridge and medium are designed to provide that the dwell time of water in the cartridge is such as to provide adequate purification.

A problem with such cartridges is that particles of the water treatment medium itself, for example black

carbon, can escape from the cartridge through the outlet slots. Whilst these particles are not harmful, their presence in the receptacle is undesirable as they are visible in the filtered water which may lead users of the jug to the mistaken belief that the filtered water is dirty. Also, as a result of turbulent back flow when water is poured into the hopper, particles of the filter medium can be back washed through the inlet slots, so that they gather and are visible in the hopper. Again this is undesirable as the hopper appears to be dirty. However, as a result of the fact that the containers with the slots are formed using plastics moulding techniques, which in practical terms limits the width of the slots to about 250μm, it is not practicable to make such slots narrow enough to prevent the particles escaping from the cartridge.

An object of the present invention is to provide a water filter cartridge in which particles of the water treatment medium are substantially prevented from escaping therefrom.

According to one aspect of this invention there is provided a water treatment cartridge according to claim 1.

The water treatment medium will usually comprise filtration granules or beads, and may optionally further comprise a particulate adsorber.

Preferred forms of reticulated screen are claimed in claims 2 to 7. The manner by which the cartridge is

provided with a mesh may be as claimed in any one of claims 8 to 10.

The container may be a two-part casing comprising a substantially cup-shaped receptacle and a closure as claimed in claim 11, so that the receptacle can be filled with the particulate water treatment medium and the closure fitted subsequently thereonto. A preferred form of the invention is claimed in claims 12 and 13. The closure may be snap-fitted onto the receptacle, as claimed in claim 14 or claim 15 so that manufacture of the cartridge is facilitated.

The mesh may have an interstice size in the range 50μm-300μm, preferably 80μm -200μm.

A handle portion may be provided. The handle portion may have finger grips thereon.

According to another aspect of this invention there is provided a water treatment cartridge according to claim 17.

According to a further aspect of this invention there is provided a water treatment apparatus, particularly a water filter jug comprising a water treatment cartridge in accordance with this invention.

Water filter cartridges in which the present invention is embodied will now be described by way of example only, and with reference to the following drawings, in which:-

Figure 1 is a side elevation, partly in section, of a water filter jug;

Figure 2 shows a sectioned fragment of a water filter cartridge;

Figure 3 is a plan view of a closure of the cartridge shown in Figure 2;

Figure 4 shows a part section on the line IV-IV of Figure 3;

Figure 5 shows a part section on the line V-V of Figure 4;

Figure 6 is a front elevation of a container of the cartridge shown in Figure 2;

Figure 7 is a perspective view of a filter insert of the cartridge shown in Figure 2;

Figure 8 is a plan view of another water filter cartridge;

Figure 9 is a side elevation of the cartridge shown in Figure 8;

Figure 10 is a sectioned fragment of the water filter cartridge shown in Figures 8 and 9, the section being on the line X-X in Figure 9;

Figure 11 is a fragmentary section showing a modification of the water filter cartridge shown in Figures 8 to 10; and

Figure 12 is a section on the line XII-XII in Figure 11.

Figure 1 shows a water filter jug which has a jug portion 1 and an removable internal hopper 2 which together define an upper and a lower compartment 3 and 4 respectively. The hopper 2 carries a water filter cartridge 5, so that when in use unfiltered water is poured into the upper compartment 3, and flows therefrom through the

cartridge 5, where it is filtered and purified, and into the lower compartment 4. This kind of jug is well known and need not be described further.

Figure 2 shows one form of water filter cartridge 6 for use as the water filter cartridge 5. The cartridge 6 has three parts; namely a generally cylindrical receptacle 7, a filter insert 9 and a closure 11.

As shown in Figures 3 and 4, the closure 11 comprises a crown portion 19 and a skirt portion 21. Integrally moulded with the crown is a hollow cylindrical handle 13 on opposing sides of which are formed finger holds 15. The finger holds 15 are provided so that when the cartridge 6 has been used and is to be removed from the hopper 2, the handle 13 can be readily grasped so that the cartridge 6 can be easily removed.

Four internal ribs 23 are provided at circumferentially spaced locations around the interior of the closure 11, each in the corner between the crown portion 19 and the skirt portion 21. A plurality of internal protrusions 26 are provided at circumferentially spaced locations around the rim of the skirt portion 21. The protrusions 26 are adapted to provide a tamper-proof snap-fit onto an external ridge 27 which is formed so as to extend circumferentially around the upper extremity of a neck portion 29 of the receptacle 7 (see Figure 6). To this end, each protrusion 26 has a chamfer formed in the radially inner edge of its face that is further from the crown portion 19. Also each protrusion 26 extends radially

inwardly from the skirt portion 21 by an amount which is a little greater than the amount by which the ridge 27 projects radially outwardly from the neck portion 29.

The neck portion 29 further comprises an integrally formed sleeve 35 which cooperates with a flange (not shown) in the hopper 2 to locate the cartridge 6 in the hopper 2 in use and form a substantially water tight seal between the hopper 2 and the cartridge 6.

Figure 2 shows the filter insert 9 is fitted in the neck portion 29. Figure 7 shows it comprises two concentric rings 39 and 40 which are spaced apart by four posts 41. The ring 39 has a spider 43 which supports a mesh 45. The other ring 40 has a slightly larger outer diameter than the ring 39. The insert 9 is fitted into the neck portion 29 so that the ring 40 abuts the top of the ridge 27 and the lower ring 39 is within the neck portion 29.

The remainder of the receptacle 7 comprises a cylindrical sidewall 33 which depends from the neck portion 29, and a bottom wall 34 in which an opening 36 is formed. The opening 36 is covered by a mesh 37. This mesh covered opening 36 serves in use as a water outlet. Openings are also formed in the neck portion 29 itself and in the closure 11, the openings in the neck portion 29 being in the form of slots 31 and the openings in the closure 11 being slots 17 and 18 formed in the handle 13 and slots 25 formed in the skirt portion 21, see Figures 3 to 5. The slots 31,17,18 and 25 and the mesh 45 of the insert 9 serve in use as a water inlet to the cartridge 6. The slots

31,17,18 and 25 also provide an escape route for air which is forced out of the cartridge 6 when water is poured therethrough.

The receptacle 7 contains a particulate water treatment medium 10 which usually comprises filtration granules or beads, and sometimes further comprises a particulate adsorber. The diameter of the particles is typically 200μm or more.

The mesh size of the mesh 37 and 45 is sufficient to allow water to flow therethrough whilst at the same time being smaller than the particles of the water treatment medium 10 so that those particles cannot escape the cartridge 6 therethrough. Usually an interstitial diameter of about 50μm-300μm is selected, preferably 80μm-200μm. The insert 9 and the receptacle 7 are manufactured so as to provide as small as possible a clearance therebetween, so that particles cannot escape therethrough.

To assemble the cartridge 6, the receptacle 7 is filled with water filter medium 10 to just below the level of the slots 31. The insert 9 is then press-fitted into place so that there is woven mesh 45 between the slots 31 and the filter medium 10. The closure 11 is then snap-fitted onto the receptacle 7, and the insert 9 is held in place by the internal ribs 23 with the radially outwardly projecting portion of the ring 40 trapped between the ribs 23 and the top of the neck portion 29 in a water-tight abutment with the top of the neck portion 29. As the closure 11 is snap-fitted onto the receptacle 11, the skirt

portion 21 is initially deflected radially outwardly, first by the wedging interaction of the chamfers formed by the outer periphery of the ring 40 and the inner edge of the projections 26 and then by the ridge 27 as the projections 26 are forced over it. Once the projections 29 have been forced passed the ridge 27, they snap back into abutment with the outer surface of the neck portion 29 below the ridge 27 due to the resilience of the skirt portion 21.

In use, the cartridge 6 is fitted to the water filter jug so that communication between the upper compartment 3 and the interior of the cartridge is enabled by the inlet which comprises the slots 17, 18, 25 and 31 and the mesh 45, and communication between the interior of the cartridge and the lower compartment 4 is enabled by the outlet which comprises the mesh 37. Hence, when unfiltered water is poured into the upper compartment 3, water flows through the slots 17, 18, 25, and 31, through the mesh 45 of the insert 9 and then into the filter medium 10. In the event of turbulent backflow of water within the receptacle 7 as water is being poured into the upper compartment 3, the abutment between the lower ring 39 and the inner surface of the neck portion 29 ensures that the water can only move upwards into the upper compartment 3 through the mesh 45 and thereby prevents particles of the water filter medium 10 moving thereinto. Once the water has filtered through the water filter medium 10 it then leaves the cartridge through the mesh 37 at the base. The presence of the mesh

37 prevents particles of the water filter medium 10 entering the lower compartment 4.

The insert 9 including the mesh 45 is formed as a one-piece molding so that the mesh 45 and the structure of the insert 9 by which it is supported is formed as an integral construction. Likewise the receptacle 7 and its mesh 36 is also formed as a one-piece molding so that the mesh 36 and the structure by which it is supported is formed as an integral construction.

Figures 8 to 10 show another water filter cartridge in which the present invention is embodied which has a closure 47 and a receptacle 49. The closure 47 has a circular crown portion 48 which is domed and from which depends a skirt portion 50, which skirt portion 50 is adapted to be fitted onto a neck portion 55 of the receptacle 49.

As with the previously described receptacle 7, a cylindrical sidewall depends from the neck portion 55 and there is a bottom wall at the lower end of that sidewall.

The cartridge is provided with a plurality of openings which serve in use as a water inlet. These openings include four mesh covered arcuate slots 53 which are formed in the crown portion 48 of the closure 11. In addition, the water inlet comprises a plurality of mesh covered apertures 57 formed at circumferentially spaced locations around the neck portion 55 of the receptacle 49. The mesh which covers the apertures 57 is moulded into the neck portion 55. The area of each of the apertures 57 is sufficiently large for there to be a negligible resistance to flow of water

through them. Even though each of these apertures 57 is covered with mesh, the resistance to flow of water therethrough is less than would arise if the narrowest of slots that, in practice, can be formed by plastic molding techniques, were to be provided in place of these mesh covered apertures 57. The skirt portion 50 extends around the neck portion 55 and thereby substantially conceals the relatively unsightly mesh covered apertures 57 from view. It is provided with a plurality of circumferentially spaced elongate slots 51 which allow a substantially unrestricted flow of water to the mesh covered apertures 57.

As with the previously described receptacle 7, an opening 36 is formed in the bottom wall of the receptacle 49. This opening 36 is covered by an integrally molded mesh 37 and serves in use as a water outlet.

To assemble the cartridge the receptacle 49 is filled with water treatment medium and the closure 47 is then placed over the neck portion 55. The closure 47 is then welded, for example by sonic welding, to the upper end of the neck portion 55.

When unfiltered water is poured into the upper compartment 3 of a water filter jug using a water filter cartridge of this type, water flows into the cartridge through the mesh which covers the arcuate slots 53, and also through the elongate slots 51 and the mesh which covers the apertures 57. In the event of a turbulent backflow of water within the receptacle 49, the fact that the closure 47 is sealed to the receptacle 49 ensures that

the water can only enter the upper compartment 3 through mesh and thereby prevents particles of the water treatment medium 10 moving upwards thereinto. Once the water has filtered through the water treatment medium 10 it then leaves the cartridge through the mesh 37 at the base, which prevents particles of the water treatment medium 10 entering the lower compartment 4.

Air displaced from the water treatment medium in the receptacle 49 by the passage of water therethrough will rise up into the interior of the closure 47 formed by the domed crown portion 48. Such airflow is unimpeded by the mesh that covers the apertures 57. Should that air collect and form any air bubble in the interior of the closure 47, that bubble will be above the mesh covered apertures 47 and thus will not impede ingress of water through those apertures 57.

It will be understood that whilst in the cartridge described with reference to Figures 8 to 10, the apertures 57 are covered by mesh which is moulded into the neck portion 55, it is possible to overlay the apertures 57 with an insert comprising a generally cylindrical or frusto-conical mesh wall supported by a suitable integrally-molded frame. Such an insert will be adapted to be received in the neck portion 55. In this example, the insert and the neck portion 55 are such that when water flows through the apertures 57 it can only enter the receptacle 49 through the mesh covered sidewall.

Figures 9 and 10 show that the closure 47 is stepped at the junction of the crown 48 and the skirt portion 50. The radially outwardly extending portion of the step rests upon the upper-edge or brim of the cup-shaped receptacle 49. The form of the closure 47 shown in Figure 10 is designed for securing to the receptacle 49 by welding, the weld to be formed between the radially outwardly extending portion of the step and the upper edge of the brim of the cup-shaped receptacle 49.

Figure 11 shows a modified form of closure 47A which is designed to be irreversibly snap-fitted to a modified form 49A of the cup-shaped receptacle. This snap fit arrangement is similar to that described above with reference to Figure 2. It is formed by the interaction of a plurality of radially-inwardly directed protrusions 26A, which are formed at spaced intervals around the inner periphery of the skirt portion 50A of the closure 47A, with an annular radially-outwardly projecting rib 27A which is formed in the neck portion 55A at a location spaced from the brim of the cup-shaped receptacle 49A. The radially outer periphery of the upper surface of the rib 27A is chamfered. The rib 27A divides the mesh-covered apertures provided in the side wall of the receptacle 49A into upper and lower mesh covered apertures 57A and 57B, neither of which provides a significant resistance to flow of water through them.

The skirt portion 50A has elongate slots 51A formed in it to provide a flow path for water to the upper mesh

covered apertures 57A. The lower edge of the skirt portion 50A is spaced from the sleeve portion 35A so as to provide a flow path for water to the lower mesh covered apertures 57B.

Figure 12 shows the form of the circumferential array of lower slots 57B. The slots 57 shown in Figure 10 would have a similar arrangement although they would be taller. Figure 12 also shows exemplary reinforcing ribs 58.

The length of the receptacles 7 and 49 should be selected so that water filtering through the water filter medium 10 contained therein does so for a sufficient length of time to enable a satisfactory level of filtration. The mesh size of the mesh used will also affect the rate of water flow, so this also has to be taken into account.

The outlet at the bottom of each of the receptacles 7 and 49 which comprises the opening 36 which is covered by the mesh 37, alternatively may comprise an insert having an integrally molded mesh portion, which insert is inserted into the bottom of the receptacle 7,49 so that in use water can only escape from the receptacle 7,49 into the filtered water compartment through the mesh of the mesh covered portion.

It will be seen that the slots on the upper portions of each of the cartridges are such that when the cartridges are in use at least one of the slots is substantially level with the bottom of the upper compartment 3 so that all of the water poured thereinto can drain away through the cartridge.

The water filter cartridge in which the present invention is embodied ensures that particles of the water treatment medium cannot enter the filtered and/or unfiltered water compartments by ensuring that a reticulated screen, or mesh, is placed in the flow path of the water so that for water to enter the filtered and/or unfiltered water compartments, it can only do so through the mesh.

CLAIMS

1. A water treatment cartridge for a water filter jug, the cartridge comprising a container having an inlet and an outlet and being for containing a particulate water treatment medium in an area of a flow path through the container between the inlet and outlet, wherein a reticulated screen is provided between said area and each of the inlet and outlet, each reticulated screen having an aperture size which is smaller than particles of the water treatment medium so as to prevent the water treatment medium particles leaving the container through either of said inlet and said outlet, each reticulated screen and surrounding structure by which it is supported being formed integrally.

2. A water treatment cartridge according to claim 1, wherein the reticulated screen comprises a mesh.

3. A water treatment cartridge according to claim 2, wherein the mesh is fabricated from filaments of metal.

4. A water treatment cartridge according to claim 2, wherein the mesh is fabricated from filaments of a plastics material.

5. A water treatment cartridge according to claim 3 or claim 4, wherein the mesh is woven.

6. A water treatment cartridge according to claim 3 or claim 4, wherein the mesh is non-woven.

7. A water treatment cartridge according to claim 3 or claim 4, wherein the mesh is knitted.

8. A water treatment cartridge according to any one of claims 2 to 7, wherein the mesh is incorporated into the container during molding of the container.

9. A water treatment cartridge according to any one of claims 2 to 7, wherein the mesh is part of an insert which is located in the container.

10. A water treatment cartridge according to claim 9, wherein the insert is press fitted into the container.

11. A water treatment cartridge according to any one of claims 1 to 10, wherein the container is a two-part casing comprising a substantially cup shaped receptacle having a side wall and a base, and a closure which is fitted in a liquid-tight manner to a brim of the cup shaped receptacle at the end of the side wall remote from the base.

12. A water treatment cartridge according to claim 11, wherein the inlet includes at least one aperture formed in the side wall, the form of the closure and the location of the or each inlet aperture in the side wall being such that there is space within the casing between the interior of the closure and the or each inlet aperture in the side wall, the reticulated screen provided between the or each inlet aperture and said area extending around the side wall so that it does not impede flow of air displaced from the particulate water treatment medium towards the space between the inside of the closure and the or each inlet aperture, that air being displaced by flow of water from

the inlet to the outlet through the particulate water medium.

13. A water treatment cartridge according to claim 12, wherein the closure has a peripheral skirt portion which surrounds that part of the side wall in which the or each inlet aperture is formed, the skirt portion having slot means formed therein to provide an access flow path for water to the or each inlet aperture.

14. A water treatment cartridge according to claim 11, claim 12 or claim 13, wherein the closure is a snap fit on the receptacle.

15. A water treatment cartridge according to claim 14, wherein the snap fit is irreversible.

16. A water treatment cartridge according to either claim 14 or claim 15 when appended to claim 10, wherein the insert is press fitted into the receptacle and has a laterally projecting portion which is trapped between the closure and the brim of the receptacle.

17. A water treatment cartridge for a water filter jug, the cartridge comprising a container having an inlet and an outlet and being for containing a particulate water treatment medium in an area of a flow path through the container between the inlet and outlet, in which a reticulated screen is provided between said area and each of the inlet and outlet, each reticulated screen having an aperture size which is smaller than particles of the water treatment medium so as to prevent the water treatment medium particles leaving the container through either of

said inlet and said outlet, the container being a two-part casing comprising a substantially cup shaped receptacle having a side wall and a base, and a closure which is fitted in a liquid-tight manner to a brim of the cup shaped receptacle at the end of the side wall remote from the base, wherein the inlet includes at least one aperture formed in the side wall, the form of the closure and the location of the or each inlet aperture in the side wall being such that there is space within the casing between the interior of the closure and the or each inlet aperture in the side wall, the reticulated screen provided between the or each inlet aperture and said area extending around the side wall so that it does not impede flow of air displaced from the particulate water treatment medium towards the space between the inside of the closure and the or each inlet aperture, that air being displaced by flow of water from the inlet to the outlet through the particulate water medium.

18. A water filter jug fitted with a water treatment cartridge according to any one of claims 1 to 17.

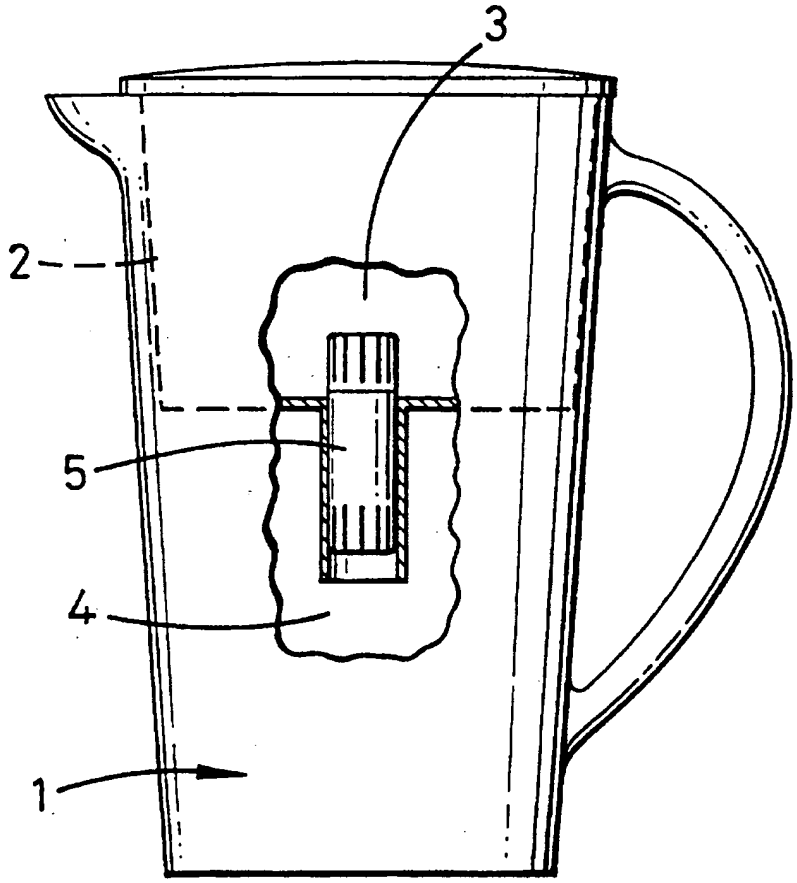
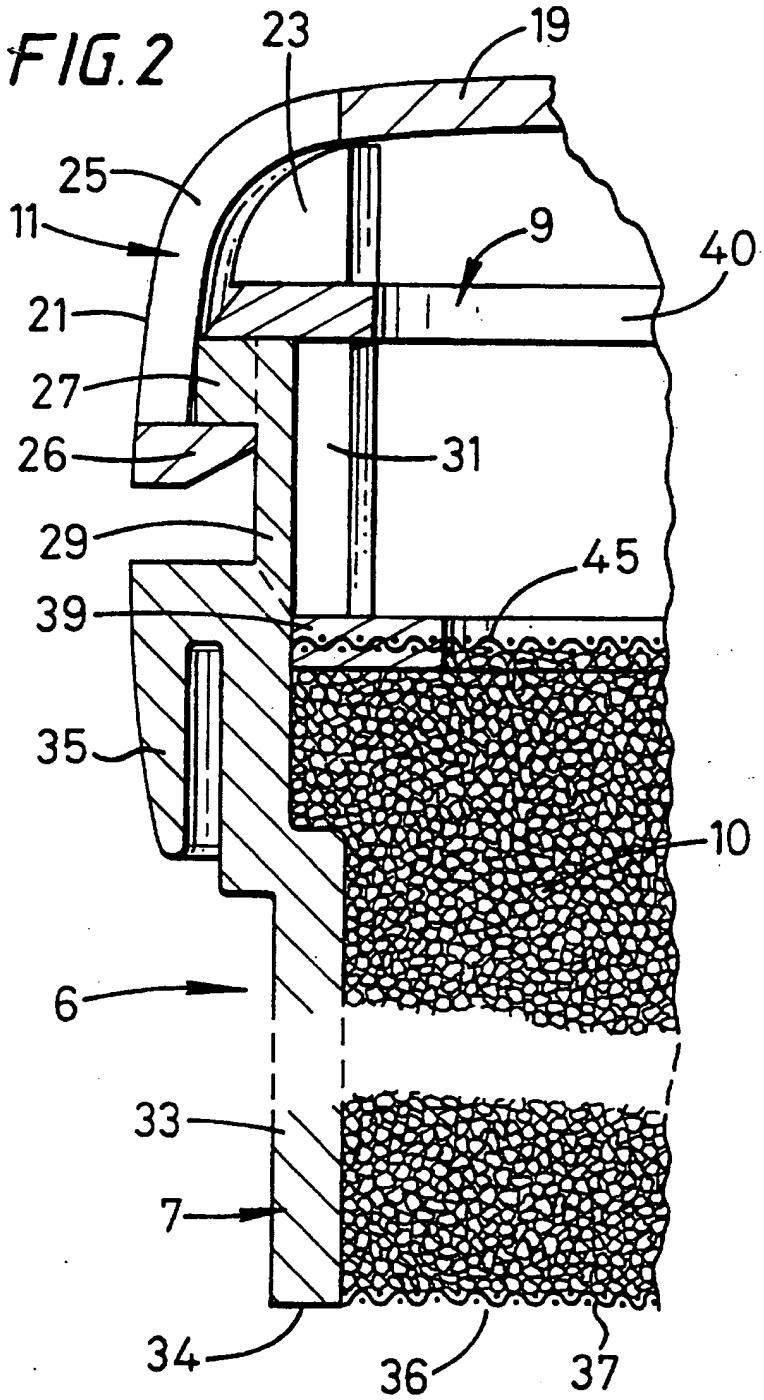



FIG. 1

FIG. 2



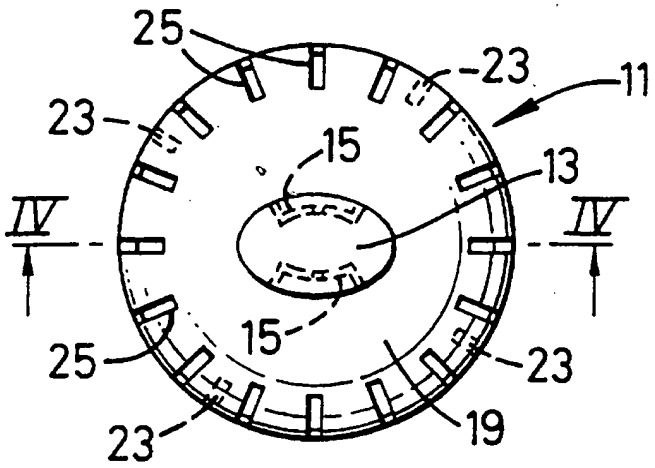



FIG. 3

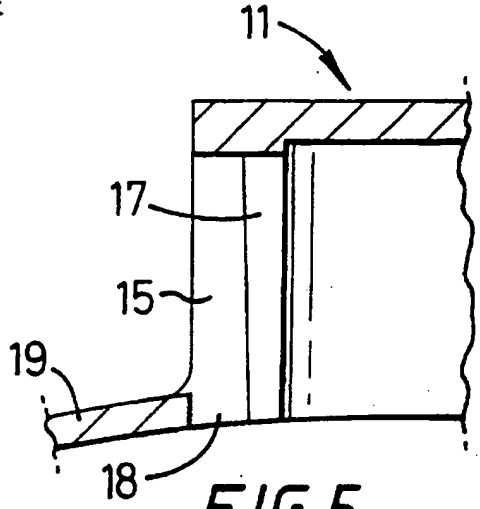



FIG. 5

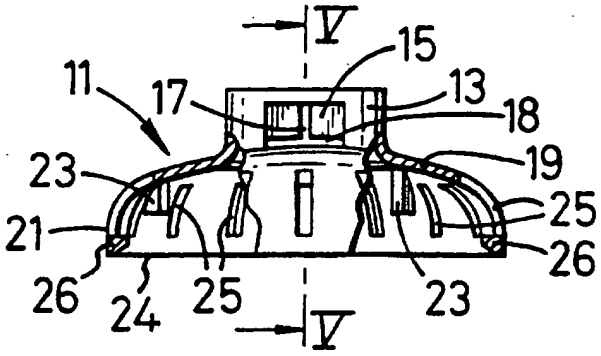



FIG. 4

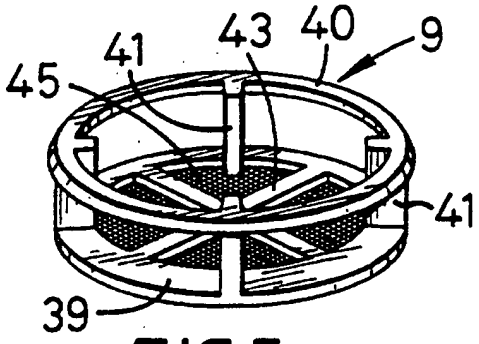



FIG. 7

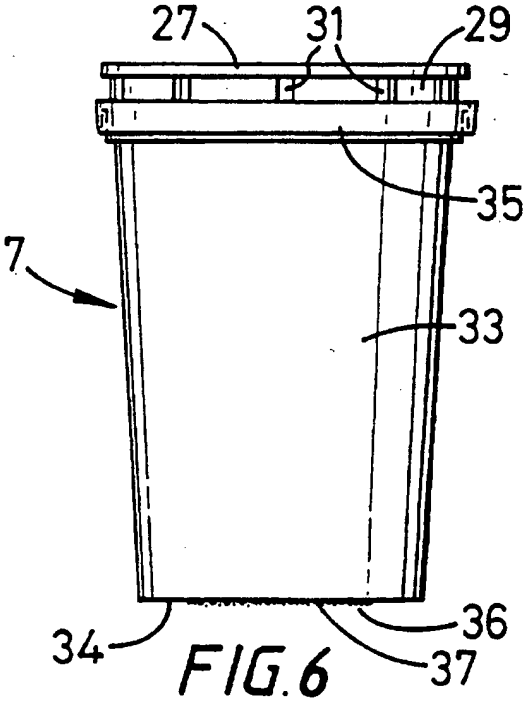



FIG. 6

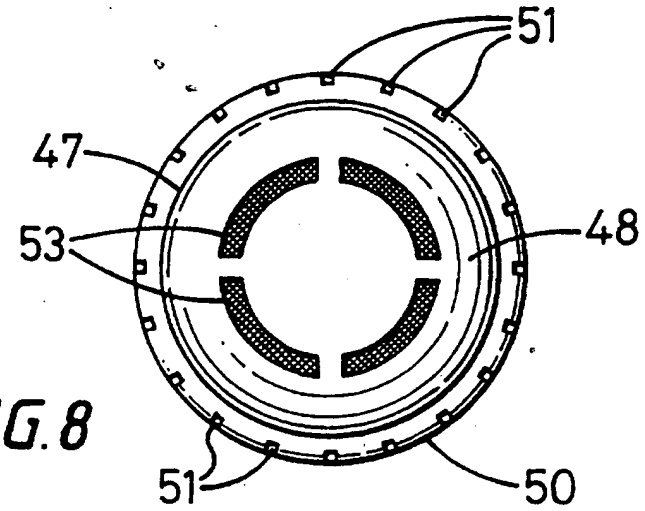



FIG.8

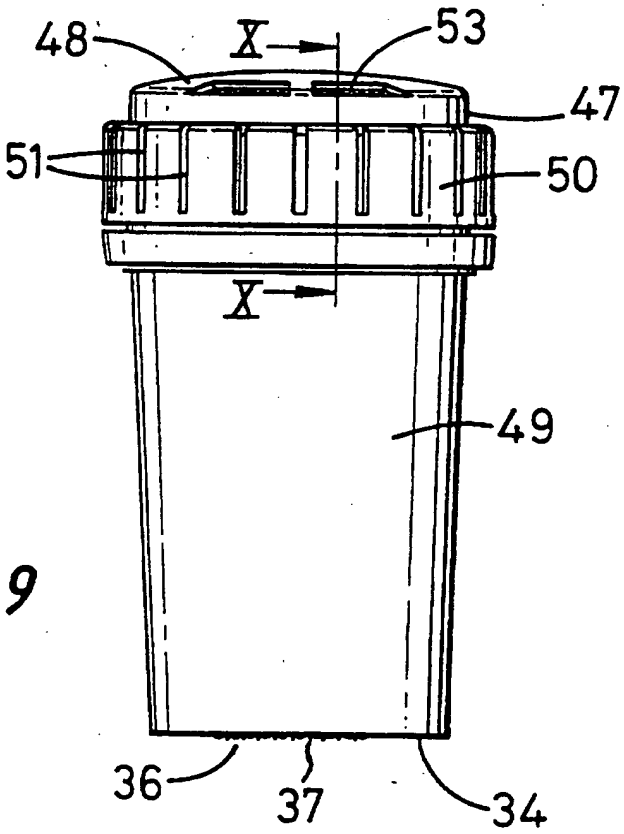



FIG.9

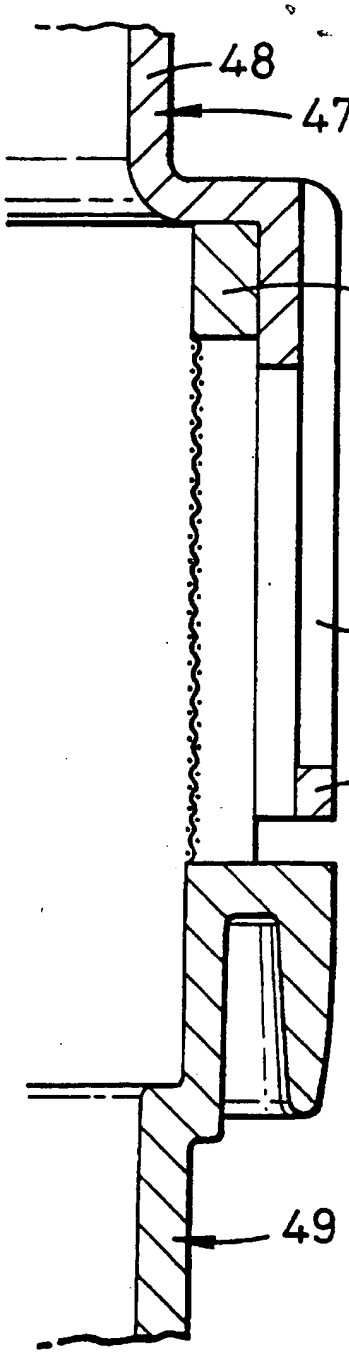



FIG. 10

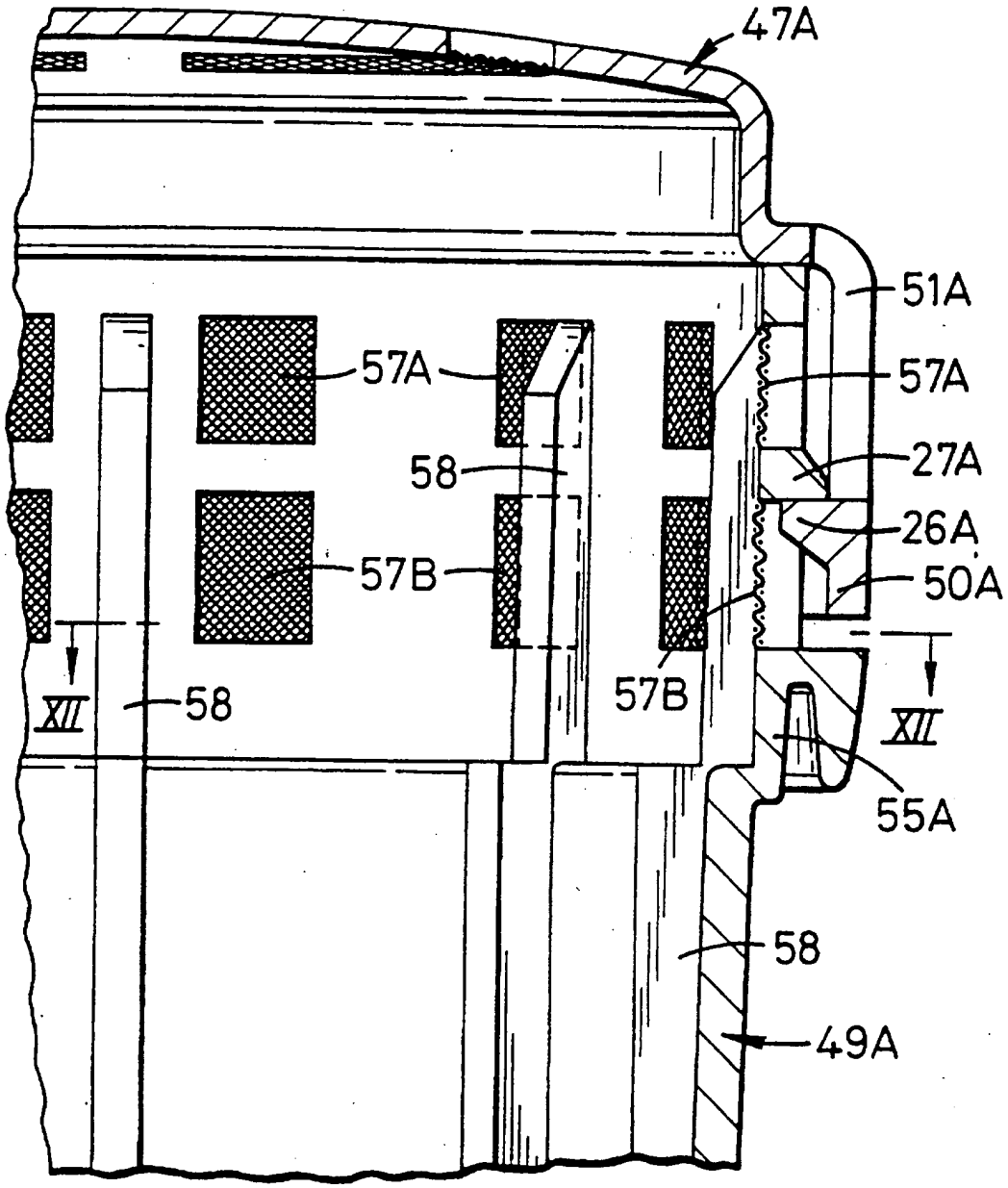



FIG.11

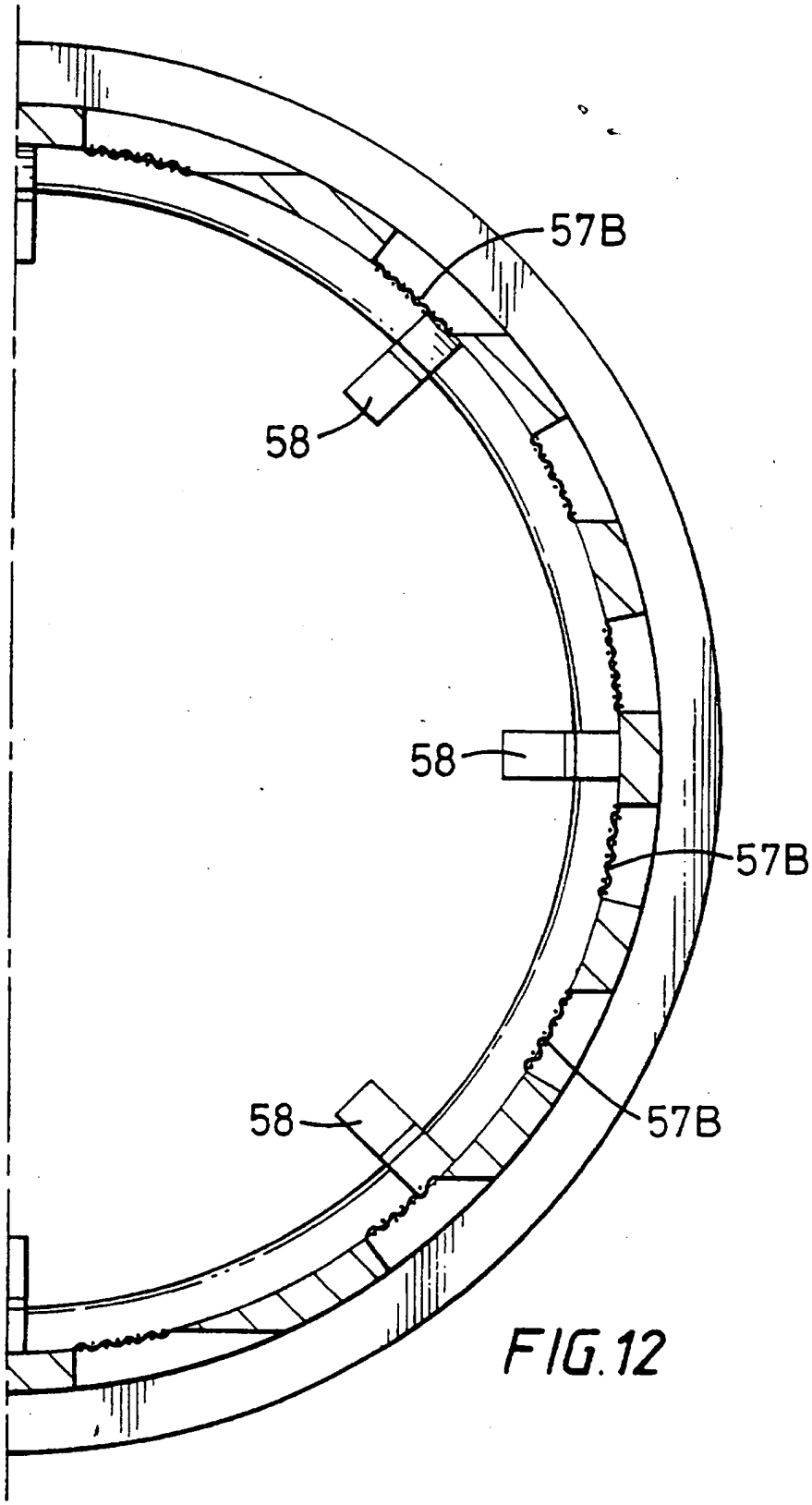



FIG.12

# INTERNATIONAL SEARCH REPORT

Interna ,nal Application No
PCT/GB 97/02120

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B01D24/12 B01D27/02 C02F1/28

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 B01D C02F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category ° | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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1

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 7 November 1997 | 19. 11. 97 |

| Name and mailing address of the ISA | Authorized officer |
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| European Patent Office, P.B. 5818 Patentlaan 2<br>NL - 2280 HV Rijswijk<br>Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,<br>Fax: (+31-70) 340-3016 | Hild, U |

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| X | US 4 995 975 A (JACQUOT WILLIAM E ET AL) 26 February 1991<br>see column 4, line 25 - column 5, line 35; figures 1,2 | 1,6,9 |
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PCT/GB 97/02120

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